

# Prospectives and Problems of Conservation, Development and Management of Clam Resource in the Bhatye Estuary Ratnagiri, Maharashtra, India

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## ABSTRACT

Bhatye estuary, Ratnagiri is known for its mussel and clam fishery. Clam fishery is primarily supported by *Meretrix meretrix*, *Katelysia opima* and *Paphia laterisulea*. The clam fishery lasts for about 8 – 10 months. During lean period of open sea fishery, it provides protein rich food and livelihood to local population... Its shells are utilized as raw material in lime and cement cottage industries. Considering its food and economic value they are over exploited. In the present study, economic and food value of clams, clam fishery, management and conservation aspects are discussed.

**KEYWORDS:** Clams, Bhatye estuary, Biochemical composition

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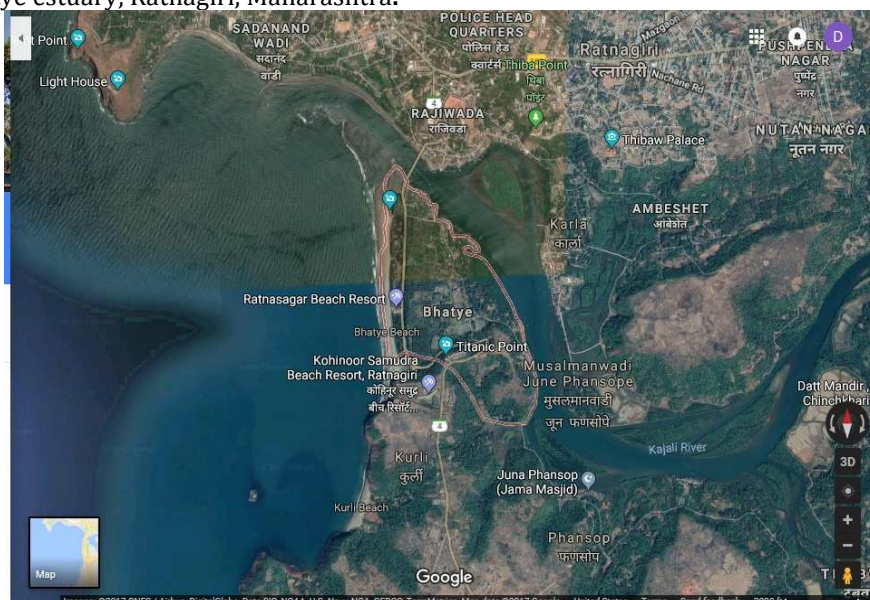


## INTRODUCTION

Estuaries are cradle bed of variety of marine and freshwater biota (Kripa, V. and Mathew Joseph; 1993<sup>1</sup>). Of the all estuaries along West coast of India, Bhatye estuary is one of the most productive estuary. It provides valuable resources like fishes, bivalves, crabs, and shrimps. It has become a source of livelihood for fishermen communities from nearby 10 villages. Thus, it plays pivotal role in rural livelihood and constitutes socio-economic entity. The commercially important bivalves are mussels and clams. Estuary is cradle bed for clams like *Meretrix meretrix* (Linnaeus), *Katelysia opima* (Gmelin) and *Paphia laterisulea* (Dilluayan). Fishing methods for clam are simple with non-mechanised gears. For fishery mainly women are involved and are carried out during low tide period. Due to its better taste, abundance during lean open sea fishery period, simple method of collection and involvement of children and women, they are over exploited. Fishery lasts for about 8 – 10 months. During monsoon they are over exploited due to ban on open sea fishing.

## Material and Methods

### 1. Study area – Bhatye estuary, Ratnagiri, Maharashtra.



Satellite image showing Bhatye estuary, Ratnagiri.

(Source: <http://www.mapIndia.com/India/maharashtra/ratnagiri>)

It is situated between 73° 15' East and 16° 51' north. It is formed due to merging of Kajali river in to Arabian sea near Ratnagiri. It has water spread of 2820 hectares and its mouth covers about 18 hectares. Its perennial opening permits an ideal estuarine zone for local fishermen.

### 2. Collection of clams and biochemical estimation-

For quantitative analysis, clams were collected by simple hand picking and chisel method. Adult clams with moderate size were selected and juvenile and small sized clams were released back in their natural habitat. Selected clams were brought back to the laboratory and shells were brushed to clean fouling biomass and mud. Length was measured by vernier calliper. Few clams were dissected and soft tissue was separated, dried in an oven (70°C). Dried tissue powder was used for biochemical analysis. Clam tissue powder was analysed for estimation of total glycogen (De Zwane and Zandee, 1972<sup>2</sup>), protein (Narasimham et al., 1993<sup>3</sup>) and lipids (Barnes and Black stock, 1973<sup>4</sup>). The ratio between total glycogen and protein was calculated. Few specimens were preserved in 70% alcohol for taxonomical identification.

### Results and discussion-

The role of the Bhatye estuary in economic development and livelihood of the local communities is pivotal. It is most productive part which covers about 2820 hectares. The sediment is rich with nutrients which is cradle bed for clams like *Meretrix meretrix*, *Katelysia opima*, *Paphia laterisulea*, *Meretrix casta*, *Paphia textile*, *Arca granulosa*. The survey made in December 2015 reveals that first three species are abundantly fished in fishery period. Similar observation was noted by V. M. Lagade, S. S. Taware and D. V. Muley (2013)<sup>5</sup>.

**Table 1- Species family, habitat zones and salinity zones of clams of Bhatye estuary**

Species	Family	Habitat zone	Saline zone
<i>Meretrix meretrix</i>	Veneridae	Intertidal	Polyhaline
<i>Katelysia opima</i>	Veneridae	Intertidal/subtidal	Mesohaline
<i>Paphia laterisulea</i>	Veneridae	Intertidal/subtidal	Mesohaline

In Maharashtra, clams are fished and utilized mainly in Ratnagiri. Three species are abundantly found in Bhatye estuary. They are *M. meretrix*, *K. opima* and *P. laterisulea*, belong from family – Veneridae. *M. meretrix* is found in intertidal zone while *K. opima* and *P. laterisulea* are found in intertidal and subtidal zone. *M. meretrix* is polyhaline and mesohaline in nature.

**Table 2- Species, length composition and fishing period of clams from Bhatye estuary**

Species	Length composition (mm)	Fishing period (months)
<i>M. meretrix</i>	22 – 64	April – September
<i>K. opima</i>	32 – 45	January – September
<i>P. laterisulea</i>	16 – 47	January – November

While sampling, size of *M. meretrix* was ranged from 22 to 64 mm in length. It's fishing season onsets on April and lasts up to September. The size of *K. opima* ranged from 32 to 45 mm in fishing period of January to September. In a fishing period January to November, the size of *P. laterisulea* ranged from 16 to 47 mm in length.

**Food value-****Table 3- Glycogen, protein and lipid content of *M. meretrix*, *K. opima*, and *P. laterisulea***

Clam species	Glycogen (mg/100mg)	Protein (mg/100mg)	Lipids (mg/100mg)
<i>M. meretrix</i>	37.063±0.012	19.025±0.220	6.042±0.068
<i>K. opima</i>	35.112±0.618	21.016±0.036	9.437±0.0362
<i>P. laterisulea</i>	30.713±0.020	26.532±0.092	9.660±0.134

Clams from Bhatye estuary represent major source of nutrients for human consumption. It makes it essential to find out important facts about nutritive value. In the present study clam tissue powder was analysed for estimation of total glycogen (De Zwane and Zandee, 1972), protein (Narasimhan et al, 1993) and lipids (Barnes and Blackstock, 1973). The study of proximate composition helps to find out the nutritional quality of food (Jorge and Mathews, 1999<sup>5</sup>). The ratio between protein and carbohydrates changes with the season and reproductive cycle (Ansari, A. D, 1972<sup>7</sup>). Glycogen content was more (37.063) in *M. meretrix* while *P. laterisulea* showed less (30.713). Protein content was more (26.532) in *P. laterisulea*, while it was less in *M. meretrix*. Lipid content was more (9.437) in *P. laterisulea* while it was less in *M. meretrix* (6.042). Beninger and Stephan (1985) observed that lipids are main energy reserves in the adult bivalves, being used in the gametogenesis and in the condition of nutritional stress.

The amount of glycogen stored in the tissue at the given moment is the balance resulting from glycogenesis and glycolysis. The glycogen has been considered as a principle energy source of adult bivalves (Achary G. P. K., 1988<sup>8</sup>) especially under condition of nutritional stress.

**Table 4- Table showing meat quality (ratio of protein to glycogen)**

Clam species	Protein(mg/100mg)	Glycogen(mg/100mg)	Ratio
<i>M. meretrix</i>	19.025	37.063	1 : 1.94
<i>K. opima</i>	21.016	35.112	1 : 1.67
<i>P. laterisulea</i>	26.632	30.713	1 : 1.15

The ratio between protein and glycogen decides taste and meat quality. In *P. laterisulca*, the ratio of protein to glycogen was 1 : 1.5, indicated better meat quality as compared to *K. opima* (1 : 1.67) and *M. meretrix* (1 : 1.94). It changes according to species, season, reproductive cycle and environmental parameters.

**Dried Clam Meat-**

Surplus catch of clams is preserved by drying process. These clams are washed either in estuarine water or potable water and boiled. The boiling may last for about half to one and half hour or more, that depends on the quantity in the boiling pot. After boiling, shells are removed and flesh sundried for 4-5 days. The shelf life of dried meat is about one year. The cost of one kilogram of dried meat was about Rs.400-600, that depend on the season and demand.

**Shell value-**

Shells are used for preparation of lime and cement. There are about 6 lime cottage industries in nearby villages. Local sell of Rs.2/Kg. Generally shells of Turbo, Trochus, Xanthus, Strombus, Cyprass, Conus, Tibia, Babylonia are used in preparation of ornamental articles. Unfortunately shells of clams are not used for preparation of ornamental articles, although having utility.

**Management and conservation-**

Clams are providing rich and cheap source of protein rich food about 8-10 months. As clam fishery is simple and operated with non-mechanised gears, clams are over exploited for food. Over exploitation and sand mining diminishing clam catch and damaging their natural habitats (Alagaraswamy, and K. A. Narsinham ;1973<sup>9</sup>). It is affecting traditional occupation of locals. Similar types of damages and disturbances are seen in other Indian estuaries (Rao. Et. Al., 1996<sup>10</sup>). For scientific and sustainable management following steps should be taken-

1. For these clam species spawning period is October-January. Clam fishing should be banned for the said period.
2. Small sized clams should not be collected.
3. State fishery department should issue licence to well informed and trained local fishermen.

**Conclusion:**

The Bhatye estuary is known for its clam fishery. The fishery mainly constitutes *Meretrix meretrix*, *Katelysia opima*, *Paphia laterisulea* and it support for 8 to 10 months. As fishing methods are simple and with least risk, women and school children are involved in clam collection and sale. Clams are not collected by dredging. It has ensured continuous and sustainable source, however during lean period of open sea fishery, they are collected indiscriminately. Due to better price, small sized clams are collected and utilized. It is hampering future stock of clams. Biochemical study revealed that protein to total glycogen ratio is better which states its nutritive value. The study has thrown light on management concern. Few recommendations have been made for the judicious exploitation, regulation of fishing and conservation of clam resource to ensure sustainable clam fishery in Bhatye estuary.

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